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Productivity Effects on Mexican Manufacturing Employment*

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Abstract: We examine the effects of labor productivity and total factor productivity (TFP) on employment across 25 Mexican manufacturing industries from 1984 to 2000. Employing panel data methods, several interesting findings emerge. First, we observe a strong and positive impact of NAFTA on employment. Second, productivity exerts a procyclical, positive effect on employment but this effect becomes smaller after NAFTA. Third, partitions of our sample according to capital-labor intensity suggest that industries which are less capital-intensive were affected negatively on impact by NAFTA but that productivity impacted employment positively after NAFTA. In contrast, more capital-intensive industries display these results in reverse.

Keywords: Employment, Labor Productivity, Mexico, Total Factor Productivity, Panel Data Methods.

JEL Classification Numbers: J23, J24, L60, 047.

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1. Introduction

Under standard approaches to the demand for labor with its marginal product (and the wage rate) on the vertical axis against the amount of labor (L) on the horizontal axis, an increase in productivity or in capital stock (if complement to labor) leads to a shift outward of the labor demand curve (see Abel et al. 2008, Chapter 3). If we assume that the labor supply curve is perfectly elastic, a shift upwards in labor demand will lead to higher employment without change in wages. Studies examining labor productivity in Mexico have indeed concluded that "the disappointing wage performance has occurred despite the fact that Mexican worker's productivity has increased since NAFTA took effect." Polaski (2004, p. 9).

While a relatively elastic supply of workers into manufacturing is plausible in Mexico, an important empirical question remains: can we trust simple labor productivity measures? Or should we resort to a more general productivity formulation in which the "Solow residual" is accounted for when the industry employs workers and capital stock? In the latter, the productivity term can be associated with the differences between output and inputs in what is known as total factor productivity (TFP). The precise treatment of Mexican productivity (whether by labor productivity or TFP) becomes especially important with the increasingly greater degree of openness of the Mexican economy that supposedly enhanced productivity: first with GATT membership in the mid 1980s and then with NAFTA in 1994.

This paper examines whether productivity increases or decreases employment, taking a special look at Mexico's second wave of trade liberalization in the mid-1990s. The relation between productivity and employment has long been explored in relation to industrial countries, especially for the US economy. There is in particular an established literature employing vector autoregressions (VAR) methods to capture whether innovations in productivity lead to increases or decreases in employment with mixed results for U.S.

manufacturing. Galí (1999), for instance, documents negative effects and Chang and Hong (2006) argue otherwise based on the aggregation of 458 4-digit U.S. manufacturing industries for the period 1958-1996. They show that technological improvements lead to increases in employment in most U.S. industries.

Having in mind the potential effects of globalization in an increasingly open economy like Mexico, it seems natural to investigate how factors such as trade integration, capital mobility and outsourcing might affect Mexico's productivity and how productivity can impinge on overall employment. Several studies have examined the evolution of Mexico's productivity. Iscan (1998), for instance, examines the trade liberalization policies adopted by Mexico after 1986 and their positive effects on productivity. Comparing the performance of Chile and Mexico during the 1980s, Bergoing et al. (2001) report a steady decline in Mexico's aggregate TFP during the 1980s and first part of the 1990s. Similar evidence for aggregate productivity is observed by Loayza et al. (2004) and Lederman et al. (2005). Likewise, studying Mexico's manufacturing industry, Montes-Rojas and Santamaria (2007) report a positive rate of labor productivity and a negative, null or slightly positive TFP evolution during the post-NAFTA era, depending on the methodology employed.

Recent years have seen a significant increase in the number of studies that examine the effects of international technology diffusion on productivity.[1] This literature proposes that the exposure of developing economies to trade and foreign capital flows has accelerated technology transfers from developed to developing countries. While these studies consistently

[1] For surveys of this literature comprising developed and developing countries see, for instance, Saggi (2002) and Keller (2004). Savvides and Zachariadis (2005) and Ciruelos and Wang (2005) present evidence of technology diffusion for panels of developing countries, while Iscan (1998), Thangavelu and Owyong (2003) and Fernandes (2007) present country specific evidence for Mexico, Singapore and Colombia, respectively. International technology diffusion is relevant for developed economies as well, as shown by the literature initiated by Coe and Helpman (1995), and Coe et al. (1997), among others.

show that technological spillovers have enhanced productivity in developing economies, little is know about the effect of productivity movements on employment levels.

To the best of our knowledge, there are no studies examining the impact of TFP changes on the Mexican labor market.[2] This paper revisits this issue under a panel data framework as an alternative to the VAR approach, in which TFP innovations (shocks) affect employment or hours worked. Contrary to the VAR methodology whose focus was on series averaging, we exploit efficiently the variability of existing data in both time and industry dimensions under several panel data methods. Data considerations based on Nicita and Olarreaga (2006) guide our methodology for the Mexican case since, at best, we would have 28 industries with available data. Eliminating the sectors with missing or incomplete data, the remaining 25 sectors have full data on output (real sector GDP), capital stock (gross fixed capital formation), value added and employment. This enables us to fully estimate TFP and labor productivity (calculated as the ratio of valued added to labor), ranging from 1984 to 2000 across 25 Mexican manufacturing industries.

Our major results are as follows. We confirm the findings by Montes-Rojas and Santamaria (2007) that productivity measures fluctuate considerably in Mexico before and after NAFTA. The evidence presented gives account of considerable variability among productivity measures; specifically between labor productivity (VA/L) and TFP. Following this finding, we employ a panel data approach to explore the relationship between productivity and labor. Making use of alternative specifications that control for factors such as sector specific effects, the business cycle, real wages and the implementation of NAFTA, we find that the latter factor has had an unambiguously positive and more than proportional effect on

[2] Related literature sheds light on this issue from different angles. For a cross-section of countries, Hall and Jones (1999) show that more open policies increase income per capita for a wide range of countries. Using plant level data for Colombia, Eslava et al. (2004) find that market reforms are associated with rising overall productivity that is primarily driven by reallocation away from low- and towards high-productivity businesses.

employment. In terms of productivity, the evidence suggests that increases in TFP and VA/L ratios have had positive effects on employment but also that this effect became smaller in the post NAFTA era. A similar trend is observed for the effect of the capital stock on employment. While the empirical evidence is in general consistent with a procyclical effect, we observe that NAFTA brought a labor-saving effect through productivity and capital which is in line with Gali's (1999) findings.

A number of other interesting results emerge from our panel data methodology. First, the standard labor demand specification has the expected signs and our findings are consistent with the theoretical framework in Abel et al. (2008), in which higher productivity produces an outward shift of the labor demand. Second, there is a very strong and positive impact of NAFTA on employment, which is higher in the case of TFP than in labor productivity. The interactive terms between NAFTA and either productivity or capital stock are, however, negative, which mitigates slightly the direct result. Consistent with Chang and Hong (2006), our estimates suggest a positive impact of productivity on employment but a less significant and reverting impact after NAFTA. Third, partitions of our sample according to capital-labor intensity suggest that industries which are less capital-intensive might have been affected negatively on impact by NAFTA but that the net effects of TFP and VA/L are positive, bringing a procyclical productivity effect on employment. Very different responses are found for the more capital-intensive industries where a countercyclical rather than procyclical net effect of productivity on employment is observed following NAFTA enactment.

The overall employment effect of opening up the Mexican economy to more transactions with the North American partners in 1994 is quite positive, which suggests that foreign capital have complemented well the potential labor force. Despite some dynamic (counteracting) effects, this central result is observed for the whole sample and either directly or indirectly (through productivity and capital effects) after splitting the sample according to the level of capital-labor intensity in each industry.

The rest of this paper is organized as follows. Section 2 describes the data and gives account of considerable variability in the productivity measures employed. Section 3 explains the empirical methodology used and Section 4 presents the empirical results. Finally, Section 5 presents the main conclusions and implications of this paper.

2. The Data

We employ data from Nicita and Olarreaga (2006) "Trade, Protection and Production database 1976-2004". The source of domestic production data is the United Nations Industrial Development Organization (UNIDO), which collects and publishes annual data from its member countries at the 3-digit level of the ISIC, Revision 2 classification. The trade data is originally sourced from the COMTRADE database, compiled by the United Nations Statistic Division, using the Standard International Trade Classification (SITC) Revision 2 classification. The data is then converted into the ISIC Revision 2 classification using concordance tables.

For Mexico, we have originally 28 manufacturing industries in the database provided by Nicita and Olarreaga (2006). The Mexican data relevant for the production functions are available until 2000 only. One (3 digit ISIC code 354: miscellaneous products of petroleum and coal) had negative gross fixed capital formation numbers for 1999 and was eliminated.[3] Two of them (code 323: leather goods and code 353: petroleum refineries) had data only from 1994 onwards and were also eliminated from our study. This leaves 25 industries aggregated at the 3-digit code, whose levels of employment, capital stock, and production vary substantially over the

[3] Capital stocks are constructed using the perpetual inventory method, assuming a 5% depreciation rate.

period.[4]

Total factor productivity is computed from a Cobb-Douglas production function defined simply as $Y=AK^{\gamma}L^{\sigma}$ with $\gamma+\sigma=1$. Output (Y) corresponds to the value of the goods produced in a year for the firms of each industry. The stock of capital (K) was built employing the perpetual inventory method, using available data on fixed capital formation and assuming a 5% constant rate of depreciation. Labor (L) corresponds to the total number of employees working for the establishments belonging to each industry. We follow a pragmatic approach and assume that the sensitivity of output to capital is one-third, based on Loria (1995, 2007)'s recent estimates of productivity for the Mexican manufacturing industry.[5] Following this assumption we simply solve from our production function for A in order to algebraically calculate TFP.[6]

Table 1 lists the 25 manufacturing industries in the sample and reports the average growth rates of labor (L), TFP, VA/L, real output (Y), real wages (W) and real capital (K) before and after NAFTA. In Table 1, stars mark lower average growth rates in the post-NAFTA era. A first glance at the overall average growth rates suggests that in most cases manufacturing labor and TFP grew faster in the post-NAFTA era but not labor productivity.[7] Nonetheless, this is not consistently observed in every individual manufacturing industry. Out of 50 post and pre-NAFTA occurrences, labor growth has the opposite sign than TFP in 25 occasions and with

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[4] We were also able to construct another sample with 17 industries that had complete data from 1976 to 2000. This sample, however, included an upward shift in the year 1984. Since we do not have a good explanation for the abnormal break in 1984, we prefer to focus on the sample covering 25 industries running from 1984 to 2000.

5 We also rely here on Aiyar and Dalgaard (2005) empirical evidence which suggests that the standard Cobb-Douglas methodology of assuming a constant capital share of one-third is a very convenient and accurate shortcut to estimating a more general formulation.

[6] We also attempted to measure total factor productivity accounting for human capital (TFPH), using Barro and Lee (2000) data on educational attainment. The estimates of TFP and TFPH, however, did not show considerable difference and we decided to proceed only with the TFP measure that does not account for human capital.

[7] Assuming the standard growth-accounting approach with Y = AF(K,L), by differentiation with respect to time and rearranging one gets $\Delta Y/Y = \Delta A/A + a_K \Delta K/K + a_L \Delta L/L$, where: a_K and a_L are capital shares and labor shares, respectively. Under constant returns to scale, $a_K + a_L = 1$. Substitution into the growth-accounting equation and subtraction of $\Delta L/L$ from both sides yields: $\Delta Y/Y - \Delta L/L = \Delta A/A + a_K (\Delta K/K - \Delta L/L)$. Since the capital/labor ratio usually grows, the equation implies that the growth rate of average labor productivity is generally higher than the growth rate of TFP.

VA/L in 27. The panel correlation coefficients between labor, TFP and VA/L are in fact considerably low for our first productivity measure (0.05) and unexpectedly negative for the latter (-0.08). This confirms that the relation between labor and productivity is not straightforward and suggests that other factors might be also playing a role.

[Table 1 here]

Labor also shows a strong response to the business cycle. In Table 1 we observe a highly consistent pattern of labor and output expansions (contractions) for the pre and post-NAFTA periods. A labor contraction (expansion) is directly related to an output fall (raise) in 42 of the 50 pre and post-NAFTA periods. The association between both variables is quite high with a correlation coefficient of 0.86, much larger than the correlation coefficients for TFP or VA/L. A similar pattern is observed for the capital stock; despite keeping a negative relationship with labor in 23 of 50 occurrences, these two variables also present a strong correlation coefficient of 0.67. Finally, with respect to real wages, we observe they performed worst in the post-NAFTA period in all but one industry (ISIC 385 on Professional, Scientific and Controlling Equipment). This in fact reflects the circumstances faced by real manufacturing wages following the depreciation of the Mexican peso at the end of 1994. This latter finding puts the relation between wages and labor at odds with what a one-sided theory of labor demand would predict by showing a slightly positive correlation coefficient of 0.05.

In order to visually observe the dissimilar behavior of labor productivity and TFP, in Figure 1 we plot the performance of our productivity measures for ISIC industry 381, fabricated metal products. The plot makes clear that TFP is less volatile than VA/L. It also shows that VA/L grows significantly after 1994. This improvement in VA/L is partially explained by the decline in the labor force that followed the considerable depreciation of the Mexican peso at the end of 1994 and the subsequent recession. Meanwhile, TFP increases and then falls in a trendless fashion, right after the aforementioned recession experienced by the Mexican economy.

As noted by Chang and Hong (2006), TFP is the "natural measure for technology because labor productivity reflects the input mix as well as technology". Intuitively, a higher VA/L may reflect higher worker productivity because more machines are available. On the other hand, TFP simply measures the contribution of all other inputs than capital (physical and human) and labor to economic growth. In the light of those significant variations in employment and productivity measures just observed, the following section employs a panel data approach that allows us to effectively control for potential cross-sectional and business cycle effects.

3. The Empirical Methodology

Panel unit root tests with lagged first-differences to account for serial correlation in the series are considered. The equation below is estimated for each of the panels discussed:

$$\Delta L_{it} = \alpha_0 + \alpha_1 L_{it-1} + \sum_{j=1}^{k} \alpha_{ij} \Delta L_{i\,t-j} + \nu_{it} \qquad (1),$$

where: L_{it} is the employment figures (number of persons employed) in manufacturing sector *i* at time *t*, Δ is the first-difference operator, and k is the number of lags. We report below the panel unit root tests proposed by Levin, Lin and Chu (2002), denoted LLC, and Im, Pesaran and Shin (2003), denoted IPS, with the Schwarz criterion employed for lag-length selection. The null hypothesis of unit root is $\alpha_1 = 0$; failure to reject the null is evidence in support of a unit root in the series. We also employ (1) on all other relevant series in this study: TFP, VA/L, K, Y, and W.

We define our demand for labor equation following Barrell and Pain (1997, 1999).[8] We assume that production in industry *i* at time *t* is given by a constant returns to scale Cobb-Douglas production function which depends on capital, K, labor, L, and a stochastic efficiency factor, Ã:

$$Y_{it}=\tilde{A}_{it}K_{it}^{\gamma}L_{it}^{\sigma} \qquad (2),$$

where $\tilde{A}_{it} = A_{it} + E_{it}$, and E_{it} is the stochastic component. Obtaining the marginal productivity of labor $\left(\frac{\partial Y_{it}}{\partial L_{it}}\right)$ and equalizing it to the real wage (W), we obtain $W_{it} = \frac{\sigma \widetilde{A}_{it} K_{it}^{\gamma}}{L_{it}^{1-\sigma}}$. Solving this identity for L_{it} and takings logs, the resulting expression leads us to specify our labor demand equation as:

$$l_{it} = \alpha_i + \mu_t + \beta_1 + \beta_2\, a_{it} + \beta_3\, k_{it} + \beta_4\, w_{it} + \varepsilon_{it} \qquad (3),$$

where our dependent and independent variables are now in logs (lowercase series). The parameter β_1 is a constant, α_i and μ_t represents unobserved industry and time specific fixed effects. The variable a_{it} captures productivity levels calculated as explained in Section 2: labor productivity (VA/L) and TFP[9]. The coefficient β_2 is expected to be positive in (3) if increases in productivity lead to labor expansions as in Chang and Hong (2006) for U.S. manufacturing: the **procyclical productivity case**. In their VAR methodology, technology shocks are interpreted as the error terms in the stochastic process between employment and productivity, possibly

[8] A similar derivation of the impact of an exogenous source such as FDI (which should affect technology) on labor demand can be found in Driffield et al. (2005). See also Hansen et al. (2006) for a recent survey.
[9] α_i, μ_t and ε_{it} conform a two-way error component as proposed by Baltagi (2003, p. 31).

controlling for other forces. In our case, rather than employing series averaging as the VAR approach does, we exploit fully the cross-section and time series of the data and focus on the impact of productivity on employment directly, also possibly controlling for other forces. On the other hand, β_2 is expected to be negative in (2) if increases in productivity lead to labor-saving decisions as in Galí (1999): the **countercyclical productivity case**. The coefficient β_3 is expected to be positive and to be higher the stronger it is the complementarity between capital and labor. The coefficient β_4 is expected to be negative in the demand for labor specification.

Allowing for productivity and capital stock in equation (3) captures standard textbook approaches to the demand for labor. Abel et al. (2008), for example, define the marginal product of labor (and the wage rate) on the vertical axis against the amount of labor (L) on the horizontal axis. The negative relationship between MPL and L characterizes the demand for labor, which may be shifted by productivity and capital stock. An increase in productivity would lead to a shift in the demand for labor outward since a beneficial supply shock increases MPL. By giving each worker more machines and equipment to work with, a rise in capital stock would also increase MPL and shift MPL up and to the right.

Industry fixed effects control for factors that vary across industries but are time invariant. The individual fixed effects may be either assumed to be correlated with the right hand side variables (fixed effects model: FEM) or be incorporated into the error term (random effects model: REM) and assumed uncorrelated with the explanatory variables.[10] Lamb (2003) argues that the choice between these two models is complicated when any of the right hand side variables are affected by measurement error. Indeed, for the model described in (3) potential endogeneity and simultaneity problems might exist due to the fact that capital, labor and wages

[10] We performed (non-reported) Hausman tests on the product of the difference between the parameter vector estimated by FEM and the vector estimated by REM and the covariance of the difference. See Johnston and DiNardo (1997) and Greene (2003).

are joint outcomes of a firm's maximization problem, and because TFP is a residual resulting from capital and labor decisions while labor productivity (VA/L) is clearly affected by the employment level. Hence, in addition to implementing conventional Hausman specification tests to decide upon the econometric model to adopt in each case, we follow two different directions to deal with endogeneity and simultaneity problems: (i) a pooled instrumental variables (IV) technique; and (ii) the use of one-year lagged explanatory variables employing generalized least squares (GLS) methods. These two techniques allow us to handle endogeneity and simultaneity, as well as other more primary econometric concerns.

Since non-reported tests suggest the presence of heteroskedasticity and autocorrelation, the estimations based on IV methods report robust standard errors, meanwhile the GLS estimations with one-year lagged explanatory variables allow for heteroskedasticity, first-order autocorrelation and cross-sectional correlation of the residuals. Allowing for cross sectional correlation under the GLS method is more likely to be appropriate provided that shocks affecting one particular industry (for instance, due to trade policy changes) might influence other industries which are vertically linked in the production chain. We attempted in addition to control for employment persistence throughout a dynamic specification in which one-year lagged employment appeared in equation (3) as an additional explanatory variable. Since the coefficient for lagged employment was insignificant under alternative specifications, we disregarded the possibility of specifying a dynamic model.

The instrumental variables procedure is implemented within the pooled IV context. After experimentation, instruments used were current exports and imports (X_t and M_t), lagged output (Y_{t-1}) and the nominal exchange rate series. We also experimented Barrell and Pain (1997)'s usage of current and lagged output, lagged real wages and several other sets of instruments but were unable to find a better fit. Given that the R^2 is not useful as a goodness of fit statistic under

GLS, to compare the IV and GLS results we estimate a pseudo-R^2. This statistic is calculated as the square of the correlation between the fitted and the observed values of our dependent variable.

Since 1995 was a year of recession for the Mexican economy, initially we excluded this year from our estimations of equation (3). We found, however, no qualitative difference between the resulting estimates and those in which we included the year 1995. The inclusion of the capital stock seems to capture and control well for the business cycle effects on employment. As a result of this, and given that our post-NAFTA observations are limited until the year 2000, we decided to leave the year 1995 in the sample.

In order to explore the direct effects of NAFTA on employment (L) and its potential indirect effects through productivity and capital, we employ an augmented model that includes a dummy for NAFTA, N_t, and interact it to our productivity measures and the capital stock. The resulting empirical model to be estimated becomes:

$$l_{it} = \alpha_i + \mu_t + \beta_1 + \beta_2 a_{it} + \beta_3 k_{it} + \beta_4 w_{it} + \beta_5 N_t + \beta_6 (N_t \cdot a_{it}) + \beta_7 (N_t \cdot k_{it}) + \varepsilon_{it} \qquad (4),$$

where the coefficient β_5 represents an employment shift associated with the implementation of NAFTA. Meanwhile, β_6 and β_7 are two slope coefficients that give account of the effects of the agreement on productivity and capital. In order to suggest that NAFTA has had a direct positive effect on employment, we would expect β_5 to be positive. As for the impacts of productivity and capital on equation (4), we observe pre-NAFTA effects (β_2 and β_3, respectively) and post-NAFTA effects of productivity ($\partial l/\partial a = \beta_2 + \beta_6$) and capital ($\partial l/\partial k = \beta_3 + \beta_7$) on employment. We expect both types of effects to be positive (negative) if their impact on employment is procyclical (countercyclical).

Since the fit of the model in (3) is always better through GLS than IV methods, the estimation of our augmented model proceeds only under GLS, employing one-year lagged rather than period explanatory variables to avoid endogeneity and simultaneity problems. Finally, following our examination of the direct and indirect effects of NAFTA, we check the robustness of our TFP results and investigate the mechanisms behind the observed relationships by partitioning the sample in groups according to their capital-labor ratios.

4. Empirical Results

LLC and IPS panel unit root tests for the variables employed in our estimations are reported in Table 2. For employment and TFP productivity levels, the unit root null is clearly rejected at the 1% significance levels for all panels. For labor productivity (VA/L), the unit root null is clearly rejected at the 1% significance levels by the IPS test but not by the LLC test. For output, the null is rejected by the LLC test at the 1% level but not for the IPS test. For capital stock, the null is rejected at the 5% level by LLC only. Since real wages (wage bill in constant prices deflated by producer prices) per sector's employee showed no discernible trend, we report both tests: with a constant only and with a constant and trend. In both cases, the unit root null can be rejected for wages as well. Based on the results from Table 2, it is fair to assess that, for any of the variables in our analysis, the panel unit roots reject the null, suggesting stationarity of the series in most of the cases.

[Table 2 here]

Table 3 reports the estimates of our labor demand model without accounting for the NAFTA effects and employing two alternative panel estimation methods: generalized least squares (GLS) with one-year lagged independent variables and instrumental variables (IV).

Estimations employing TFP and VA/L as productivity measures are reported in each case with industry fixed effects only and with industry and time effects.

[Table 3 here]

As can be observed from Table 3, in general the parameters for one-year lagged productivity, capital and real wages under GLS methods are all significant and present the expected sign, although less than proportional. Controlling for time effects reduces the impact of the productivity measures. For TFP the coefficient β_2 is 0.474 when we control for industry effects only. This suggests that a 1% increase in productivity leads to a 0.47% increase in employment. After controlling for industry and time effects, the coefficient decreases to 0.172. For VA/L, β_2 declines from 0.152 to 0.022; only in the latter the significance of the productivity parameter is slightly reduced to the 5% level. A similar pattern is observed with the capital coefficients (β_3 declines from 0.410 to 0.261 for TFP and from 0.364 to 0.195 for VA/L) and the opposite occurs for the real wages coefficients (β_4 declines from -0.174 to -0.367 for TFP and from -0.057 to -0.300 for VA/L). The fit of the model marginally improves when time effects, alongside industry effects, are included in the estimation. The pseudo-R^2 increases from 0.791 to 0.825 for TFP and from 0.743 to 0.795 for VA/L. One possible explanation for this improvement in the model's fitness is that time effects are partially capturing the effects of NAFTA on employment.

The estimates through IV are also reported in Table 3. As explained earlier, after experimentation current exports and imports and lagged output series were found to serve well as instruments for TFP and were employed in the IV panel data estimations.[11] We implement error-orthogonality tests similar to those used by Revenga (1992, p. 274), in which the two-

[11] For causal links between exporting and productivity using plant-level data in Colombia, Mexico and Morocco, see Clerides et al. (1998). As for the relation between imports and productivity, Keller (2000) provides evidence on how intermediate imported inputs can contribute to productivity growth.

stage least squares residuals are regressed on the set of instrumental variables. The statistic formed by N times R^2 from this regression, where N equals the degrees of freedom from the original equation, asymptotically follows a chi-squared distribution. We report this statistic in Table 3 right below the coefficients of the IV estimation. A weak relationship between the residuals and the instruments would indicate that the equation is properly specified.

The estimates for TFP by IV methods present the expected sign and are significant except for real wages in the estimations with time and industry effects. In the latter the real wage coefficient is significant only at the 12% level. In contrast to the GLS estimations, coefficients are larger when time and industry effects rather than industry effects only are included in the model. The fit of the models is, however, lower and quite poor when time effects are employed in the estimations. For the VA/L estimates we were unable to find better instruments than those employed for TFP. A limitation of our dataset is the reduced number of variables available to be used as instruments for VA/L. Employing for VA/L the same instruments than for TFP, we observe that under both specifications, with industry effects only and with industry and time effects, the coefficients present the expected sign but are not significant except for real wages in the first specification. As clear from the row named "χ^2-stat. for IVs", given the value of the statistic, the null of no misspecification can not be rejected at any relevant significant level for TFP or VA/L.

The results in Table 3 are in general consistent with the procyclical case in which productivity measures and capital have a positive impact on employment as in Chang and Hong's (2006) empirical findings for US manufacturing. Provided that NAFTA might have attracted additional capital flows, enhanced productivity and increased employment, in what follows we account for the total effect of NAFTA on employment and for its indirect effects on productivity and capital. Since the model fit under IV is not as good as under GLS for any of our specifications, we decided to adopt GLS rather than IV methods for the estimations of the model that control for the NAFTA effect.

Table 4 reports the estimation of equation (4) in which we control for the direct and indirect effects of NAFTA on employment using GLS and one-year lagged explanatory variables. Because we are interested in the direct effect of NAFTA on employment and the inclusion of time effects and a dummy for NAFTA (N_t) leads multicollinearity problems, in what follows our estimations only control for industry effects. For each productivity measure (TFP and VA/L), the models estimated in columns (*a*)-(*c*) control for the direct effect of NAFTA on employment (through β_5) and for its indirect effects through productivity (through β_6) and/or capital (through β_7).

In general, the coefficients for productivity, capital and wages report the expected sign and are statistically significant. The coefficients for NAFTA (β_5's) are positive, significant and more than proportional but the interactions with our productivity measures (TFP and VA/L) and capital (β_6 and $\beta_{7,}$ respectively) present negative and significant coefficients. Looking first at the partial effects of productivity on employment ($\partial l/\partial a$) in column (*a*), for both productivity measures we observe initially a positive and significant effect (0.757 for TFP and 0.272 for VA/L) that remains positive but becomes smaller following NAFTA ($\beta_2+\beta_6$=0.527 for TFP and 0.158 for VA/L). Wald tests for the joint significance of productivity on employment are reported at the bottom line of columns (*a*). For both productivity measures, the Chi-square statistics strongly suggest that the null of no joint significance (i.e. Ho: $\beta_2=\beta_6$ =0) must be rejected. These results initially suggest the existence of an aggregate procyclical effect of productivity which is consistent with Chang and Hong's (2006) findings.

[Table 4 here]

A possible reason behind the negative and significant indirect effects found in column (*a*) might be the multicollinearity between them and the dummy for NAFTA. We observe very high correlations between the NAFTA interactive terms (correlation coefficient of 0.99). To control for this collinearity problem, we present the estimations of the model with the dummy for NAFTA and each of the interactive terms separately under columns (*b*) and (*c*) of Table 4. For both productivity measures, we confirm the initial results. The effects of the separate interactive terms remain negative and highly significant while the overall net effect of NAFTA stays positive.[12] Again, these results are consistent with the procyclical finding documented by Chang and Hong (2006) for U.S. manufacturing under VAR methods. There is, however, some sort of 'labor-saving effect' in the post-NAFTA era associated with the decline of the positive indirect effects of productivity and capital on employment. This 'labor-saving effect' would be in line with those discussed by Gali (1999) for U.S. manufacturing.

Across all the estimates presented in Table 4, we find that the net impact of NAFTA on Mexican manufacturing employment is positive and highly dependent on the direct effect (β_5). Also, the impact of NAFTA on employment is higher when TFP is used instead of labor productivity. Overall, there is support for the proposition that employment benefits from productivity gains. Nevertheless, provided that we are controlling for other labor demand determinants, we infer that the additional productivity and capital that resulted from trade and financial openness under NAFTA contributed towards a decline in the rate of expansion of employment. This result might well be caused by the increasing efficiency of the labor force and/or by the efficiency gains attained by the mix of all the factors combined.

In order to check the robustness of the results and investigate the mechanisms behind the relationships observed in Table 4, we rank the 25 industries in our sample according to their

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[12] Under column (*b*) the Wald test null of no joint significance of productivity on employment is strongly rejected.

capital-labor intensity and split the sample in groups. A problem of splitting the sample has to do with the limited number of observations in each sub-sample. Because of this problem, we accumulate every additional partition so that the estimations reported consider the industries with the lowest 5, 10, 15, 20 and largest 5 capital-labor ratios.

Several interesting results emerge from the estimations presented in Table 5 for each subsample. First, as judging from the direct impact of NAFTA captured by β_5, there is an increasingly positive direct effect of the agreement on industries with higher capital-labor ratios as we move from smallest capital intensity to largest capital intensity. For estimates using TFP or VA/L, the industries with the smallest and largest 5 capital-labor ratios experience opposite, more than proportional and statistically significant direct effects from NAFTA. For the first group the implementation of NAFTA led to a 3.1% decline in employment under TFP (3.2% under VA/L) while for the latter it represented a 6.3% increase (3.6% under VA/L). Indeed, the group of industries with the "smallest 5" capital-labor ratios had its employment levels more negatively affected as a result of NAFTA. We conjecture that the increasing competition brought by trade openness under NAFTA inflicted more heavily on labor-intensive industries, ultimately leading to an employment contraction.[13]

Second, it is clear from the columns labeled "smallest 5" that relatively labor-intensive industries were negatively affected by the implementation of NAFTA but also that *ex-post* they indirectly benefited from higher productivity and capital complementarity. Looking at the *ceteris paribus* effects of productivity on employment ($\partial l/\partial a$) among these labor-intensive industries, we observe a negative but non-significant pre-NAFTA impact for TFP (β_2 = -0.164) and an equally negative but significant effect for VA/L (β_2 = -0.466). Meanwhile, following NAFTA we

[13] Notice that 1995 was a critical moment for the Mexican manufacturing industry as the downturn of the economy caused real GDP to fall abruptly right after the currency crisis of December of 1994. The business cycle effect of the crisis is, however, controlled by the inclusion of capital in our model.

observe positive and significant effects for TFP ($\beta_6 = 0.392$) and VA/L ($\beta_6 = 0.754$ and $\beta_2+\beta_6 = 0.288$)[14]. These results suggest that relatively labor-intensive industries might have reverted a countercyclical into a procyclical productivity effect, following NAFTA's enactment in 1994. A potential explanation for this result is that the availability of foreign capital for those relatively labor-intensive industries might have resulted in larger complementarity between labor and capital, productivity increases and thus higher rather than lower employment in the post-NAFTA era. In the case of TFP, this larger complementarity can be corroborated from observing the positive partial effect of capital on employment ($\partial l/\partial k = \beta_3+\beta_7 = 0.076$). Interestingly, for TFP estimates the post-NAFTA procyclical productivity effect extends to the groups of industries with the 10 and 15 lowest capital-labor ratios. This effect, however, turns out to be less important as the partial effect on capital on employment becomes smaller or negative.

We also observe in Table 5 that the increasing availability of foreign capital following NAFTA did not bring positive indirect effects for relatively capital-intensive industries. For the 5 industries with the largest capital-labor ratios in the sample, there is an overall positive net effect of NAFTA but a detrimental rather than procyclical partial effect of productivity on employment ($\beta_2 + \beta_6 = -0.198$ for TFP and= -0.239 for VA/L). The results suggest that those industries that already had capital abundance were less capable of obtaining productivity gains, and thus of creating additional employment.

Overall, the effect of NAFTA (β_5) is positive on impact for industries with high capital intensity which are better positioned to create jobs at the time of opening markets to foreign capital. The total effect depends, however, also on the interaction between the NAFTA dummy and either productivity (β_6) or capital (β_7) terms which contain the dynamic effects. At the time of the second wave of trade liberalization in Mexico after 1994, industries with high (low) K/L were able to increase (decrease) the number of job positions. The positive employment effect for the industries with largest capital/labor ratios is, however, mitigated by diminishing returns to the inflows of capital and innovation. The opposite is observed for industries with low capital/labor ratios, despite being affected by increasing competition following trade openness under NAFTA, for these industries capital-labor complementarity led to accompanying further hiring of labor at the time of opening the borders to foreign capital. Note that similar patterns are observed in Table 4 for manufacturing as a whole. The immediate impact of opening up to transacting with the North American partners around 1994 is strongly positive. The interaction of the NAFTA dummy with productivity and capital stock causes, however, a negative effect on employment. In spite of this, the overall net effects of productivity and capital are quite positive, which suggests that the net result is that Mexican manufacturing employment gained with the decision to sign the NAFTA treaty.

5. Concluding Remarks

This paper examines the role of productivity changes in the Mexican manufacturing labor market. The evidence suggests considerable variability among the productivity measures used. Controlling for factors such as sector specific effects, the business cycle, real wages and the implementation of NAFTA, the panel data approach indicates that increases in TFP and VA/L ratios have had positive effects on employment. Plus, there are some indirect and slightly negative effects in the post-NAFTA era. A similar trend is observed for the effect of the capital stock on employment, suggesting a lower complementarity between capital and labor after

[14] Under TFP the net productivity effect following NAFTA is only equal to β_6 due to the non-significance of β_2. Nonetheless, looking at the column for the industries with the smallest 10 capital-labor ratios, we observed that $\beta_2 = -0.169$ is significant as is $\beta_6 = 0.179$. For this group the net effect remains positive but very small ($\beta_2+\beta_6 = 0.010$).

NAFTA. For the aggregate 25 industries in the sample, NAFTA has had an unambiguously positive and more than proportional effect on employment. Consistent with Chang and Hong (2006), who estimated employment effects of technology *shocks* for most of U.S. manufacturing, our estimates suggest a net positive impact of TFP on employment.

Partitioning the sample according to capital-labor ratio intensities, our estimates suggest that labor-intensive industries are rather negatively affected by NAFTA but indirectly gained from the availability of capital (possibly foreign) by increasing employment. The opposite holds for more capital-intensive industries, which seem to gain on impact due to NAFTA, but not indirectly through productivity or capital.

Since productivity measures vary considerably and the availability of capital seems to influence our results, one implication of this study is that researchers should try to make use of detailed industry level datasets such as the one from Nicita and Olarreaga (2006) used in this paper or firm level datasets. Not doing so would lead to misleading results based only on labor productivity and aggregate information. Finally, it is also important to consider that the analysis in this paper operates through shifts in the labor demand curve. The alternative viewpoint by Jayachandran (2006) explores how wages respond to productivity using a labor supply framework and is left for further research. Also, further work may shed light on specific measures of trade policy in order to capture alternatively the effects of NAFTA that we observed in this paper by using dummy variables.

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Figure 1. TFP and VA/L Behavior over Time for Industry 381: Fabricated Metal Products

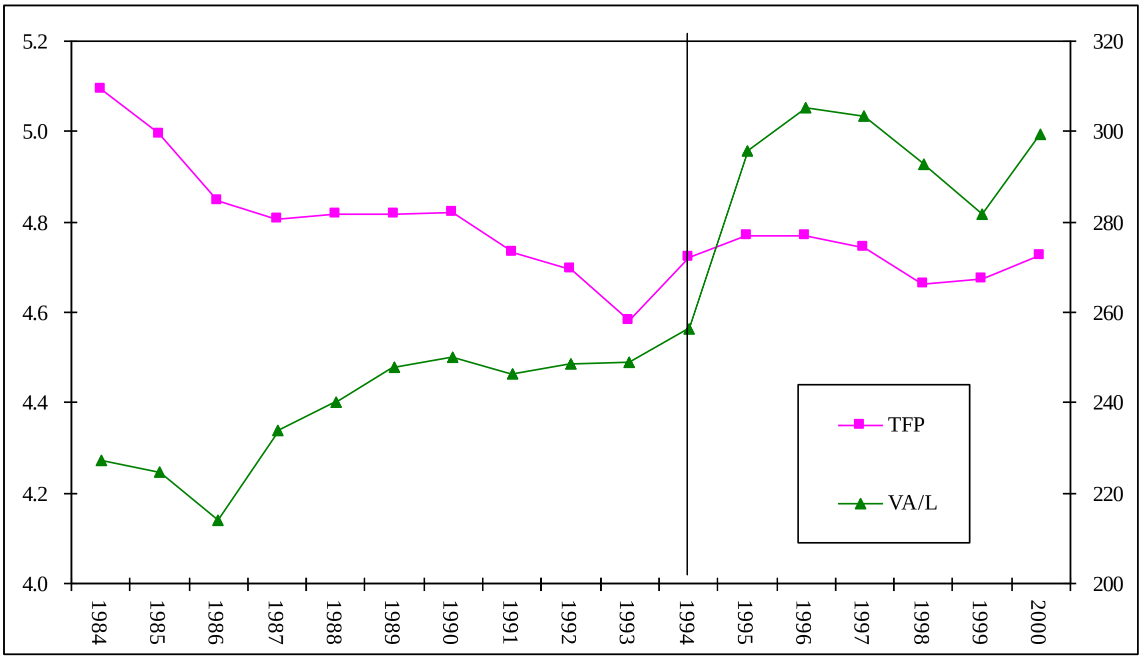

Table 1: Pre and Post-NAFTA Average Growth Rates

ISIC	Variable: Description	L pre	L post	TFP pre	TFP post	VA/L pre	VA/L post	Y pre	Y post	K pre	K post	W pre	W post
311	Food products	0.03	0.69	-3.18	-2.80	2.44	1.54 *	1.31	1.94	14.51	14.19 *	4.27	-0.37 *
313	Beverages	1.57	0.48 *	-0.36	0.45	2.36	1.64 *	3.67	4.62	9.11	11.79	4.93	-0.44 *
314	Tobacco	0.50	-2.74 *	4.91	-4.53 *	7.39	-2.35 *	7.61	-4.07 *	7.67	8.21	7.64	-1.08 *
321	Textiles	-4.53	1.74	-4.37	-3.79	-0.21	-0.25 *	-5.20	2.12	7.07	15.93	1.85	-2.34 *
322	Clothing	-2.80	1.45	-11.18	-6.63	0.16	-3.56 *	-4.98	0.60	39.70	23.14 *	2.54	-3.37 *
324	Footwear, except rubber or plastic	-8.03	-1.05	-8.34	-4.59	1.88	-3.15 *	-6.62	-1.53	33.78	11.60 *	4.29	-3.88 *
331	Wood products, except furniture	-5.98	-2.51	-0.13	-4.97 *	2.67	0.70 *	-4.51	-1.05	-0.12	19.03	0.63	-1.62 *
332	Furniture, except metal	-2.50	0.04	-5.46	-7.18 *	1.61	-0.95 *	-0.06	0.83	27.87	27.93	3.61	-2.81 *
341	Paper and paper products	-2.13	1.07	-1.98	1.73	0.84	4.87	-1.05	5.82	8.29	10.52	2.62	-0.72 *
342	Printing publishing and allied industries	-2.70	-1.13	-9.52	-4.34	2.34	-1.78 *	-0.89	-0.59	43.09	14.74 *	4.74	-2.58 *
351	Industrial Chemicals	-3.88	-1.31	-5.31	1.71	-0.44	1.64	-4.26	4.25	12.17	10.67 *	4.77	0.67 *
352	Other chemical products	1.03	0.92 *	-1.00	-0.58	6.08	5.17 *	3.07	6.05	10.45	19.50	6.36	1.22 *
355	Rubber products	-2.67	1.01	-5.43	-0.97	-3.69	-1.24	-5.82	3.65	4.91	12.31	2.64	1.23 *
356	Plastic products	1.33	1.30 *	-6.84	-2.90	1.34	0.16 *	1.21	3.91	31.25	20.36 *	3.82	-1.92 *
361	Pottery, china And earthware	1.92	4.77	-7.81	-1.91	2.09	-1.80 *	4.16	3.84 *	47.05	8.51 *	4.46	-0.87 *
362	Glass and glass products	-0.27	1.74	-1.51	-2.15 *	1.93	-2.42 *	0.91	0.44 *	8.77	4.51 *	5.68	-3.00 *
369	Other non metallic mineral products	-2.50	-4.15 *	4.24	4.33	7.38	8.40	4.06	3.65 *	4.89	5.42	5.36	-1.66 *
371	Iron and steel industries	-8.40	1.21	1.83	3.87	5.42	5.19 *	-3.66	8.98	0.94	13.20	4.32	0.17 *
372	Non ferrous metal basic industries	-2.73	1.56	-5.68	-1.18	2.00	2.09	-5.47	5.01	6.60	18.67	4.25	-2.69 *
381	Fabricated metal products	-2.81	-0.12	-5.39	0.14	1.08	2.83	-1.68	3.93	19.16	13.29 *	4.35	-2.13 *
382	Non electrical machinery	-3.70	4.29	-0.58	1.08	3.82	0.94 *	1.81	13.10	17.05	29.82	4.45	-1.55 *
383	Electrical machinery appliances	-2.84	3.42	-5.23	-1.28	2.01	-1.21 *	-1.93	4.73	17.36	12.11 *	2.08	-0.90 *
384	Transport Equipment	-0.68	3.66	3.36	4.06	6.85	4.95 *	8.30	11.23	17.33	15.44 *	5.32	-0.67 *
385	Professional, Scientific and Controlling Equipment	1.90	5.22	-0.09	3.97	4.29	11.29	8.66	19.18	33.35	38.30	-3.91	-2.29
390	Miscellaneous Manufactures	1.09	0.52 *	-9.15	-2.99	-1.31	0.09	-0.52	2.92	33.49	19.00 *	4.03	-2.56 *
	Overall average growth rates	-1.99	0.88	-3.37	-1.26	2.41	1.31	-0.08	4.14	18.23	15.93	3.80	-1.45

	TFP	VA/L	Y	K	W
Overall Corr(L,Variable)	0.05	-0.08	0.86	0.67	0.05
positive correlation coefficients	13	10	21	20	6
negative correlation coefficients	12	15	4	5	19

Table 2: Panel Unit Root Tests for 1984-2000

$$\Delta x_{it} = \alpha_0 + \alpha_1 x_{it-1} + \sum_{j=2}^{k} \alpha_j \Delta x_{i\,t-j+1} + \nu_{it} \qquad (1),$$

where x = L, TFP, TFPH, VA/L, Y, K, and W.

	Panel Unit Root Tests		**N * T**	**k**
Intercept only	LLC	IPS		
TFP	-11.553*** [0.000]	-7.393*** [0.000]	392	2 lags
W	-3.608*** [0.000]	-2.854*** [0.002]	377	2 lags
Intercept and Trend	LLC	IPS		
L	-5.197*** [0.000]	-1.695** [0.045]	395	3 lags
VA/L	-0.923 [0.178]	-3.519*** [0.0002]	370	3 lags
K	-6.804*** [0.000]	-1.204 [0.114]	366	3 lags
Y	-3.587*** [0.000]	-0.570 [0.285]	390	3 lags
W	-2.854*** [0.002]	-3.066*** [0.001]	371	3 lags

Notes: Reported statistics are for the series in levels. The number of cross-section units is always 25 while the number of time periods varies across series. For the panel unit root tests LLC and IPS under the unit root null, the p-values are given in brackets. The number of lags (k) was chosen by the Schwarz criterion. The symbols *, **, and *** refer to levels of significance of 10%, 5%, and 1%, respectively.

Table 3. Estimations through GLS and IV

$$l_{it} = \alpha_i + \mu_t + \beta_1 + \beta_2 a_{it(-1)} + \beta_3 k_{it(-1)} + \beta_4 w_{it(-1)} + e_{it} \quad (1)$$

where A_{it}=TFP, VA/L

	GLS				IV			
	TFP		VA/L		TFP		VA/L	
Models:	industry effects only	industry and time effects	industry effects only	industry and time effects	industry effects only	industry and time effects	industry effects only	industry and time effects
β_1	2.193***	8.159***	3.892***	8.638***				
	(0.222)	(0.237)	(0.142)	(0.167)				
β_2	0.474***	0.172***	0.152***	0.022**	1.759***	2.150*	3.044	9.089
	(0.151)	(0.013)	(0.012)	(0.008)	(0.390)	(1.241)	(2.879)	(16.335)
β_3	0.410***	0.261***	0.364***	0.195***	0.492***	0.709***	0.131	0.717
	(0.010)	(0.012)	(0.008)	(0.011)	(0.076)	(0.258)	(0.243)	(0.691)
β_4	-0.174***	-0.367***	-0.057***	-0.300***	-0.902***	-2.288[a]	-2.057*	-9.561
	(0.028)	(0.023)	(0.016)	(0.019)	(0.305)	(1.401)	(1.137)	(17.743)
χ^2-stat. for IV					0.240	0.004	3.200	0.004
R^2	0.791	0.825	0.743	0.795	0.331	0.007	0.435	0.019

Notes: The series are in logarithms. The α_i and μ_t terms are included in the estimation but are omitted in the table. Productivity is measured by either labor productivity (VA/L) or total factor productivity (TFP). For IV, the entries below the coefficients are bootstrapped Newey-West standard errors robust to heteroskedasticity and first-order autocorrelation. For GLS, standard errors are specified to allow for heteroskedasticity, first-order autocorrelation and cross-sectional correlation of the residuals. The symbols *, **, and *** refer to levels of significance of 10%, 5%, and 1%, respectively; 'a' denotes significance at the 12% level.

Table 4: FEGLS Estimations of Employment

$L_{it} = \beta o + \beta_{1i} + \beta_2 A_{it-1} + \beta_3 K_{it-1} + \beta_4 W_{it-1} + \beta_5 N_t + \beta_6 (N_t{*}A_{it-1}) + \beta_7 (N_t{*}K_{it-1}) + \varepsilon_{it}$ (3)

where A_{it}=TFP, VA/L

	TFP			VA/L		
coeff.	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)
β_0	0.109	1.146***	1.195***	3.088***	3.334***	3.392***
	(0.179)	(0.192)	(0.189)	(0.141)	(0.120)	(0.163)
β_2	0.757***	0.722***	0.640***	0.272***	0.267***	0.204***
	(0.019)	(0.016)	(0.021)	(0.013)	(0.010)	(0.012)
β_3	0.451***	0.400***	0.439***	0.376***	0.365***	0.387***
	(0.009)	(0.008)	(0.008)	(0.009)	(0.007)	(0.009)
β_4	-0.197***	-0.214***	-0.279***	-0.094***	-0.101***	-0.110***
	(0.025)	(0.023)	(0.021)	(0.016)	(0.014)	(0.020)
β_5	2.815***	1.651***	1.937***	1.655***	0.995***	1.355***
	(0.164)	(0.051)	(0.074)	(0.097)	(0.035)	(0.085)
β_6	-0.230***	-0.315***		-0.114***	-0.161***	
	(0.009)	(0.008)		(0.007)	(0.005)	
β_7	-0.102***		-0.115***	-0.059***		-0.081***
	(0.010)		(0.005)	(0.006)		(0.004)
pseudo-R^2	0.759	0.778	0.767	0.726	0.734	0.733
Wald test	1768.4	3430.4	2815.0	531.2	1234.2	1985.9
[p-value]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Notes: The series are in logarithms. The α_i's terms are included in the estimation but are omitted in the table. Productivity is measured by either labor productivity (VA/L) or total factor productivity (TFP). For GLS, standard errors are specified to allow for heteroskedasticity, first-order autocorrelation and cross-sectional correlation of the residuals. The symbols *, **, and *** refer to levels of significance of 10%, 5%, and 1%, respectively. Wald tests statistics for the null hypothesis of β_2=β_6=0 are reported under columns (*a*) and (*b*), in column (*c*) the null hypothesis is that β_3=β_7=0.

Table 5. Capital-Labor Intensity Partitions

$$l_{it} = \alpha_i + \beta_1 + \beta_2 a_{it-1} + \beta_3 k_{it-1} + \beta_4 w_{it-1} + \beta_5 N_t + \beta_6 (N_t * a_{it-1}) + \beta_7 (N_t * k_{it-1}) + \varepsilon_{it} \quad (4)$$

where A_{it}=TFP, VA/L

	TFP					VA/L				
	smallest 5	smallest 10	smallest 15	smallest 20	largest 5	smallest 5	smallest 10	smallest 15	smallest 20	largest 5
β_1	10.799***	9.767***	9.043***	-0.049	8.951	12.303***	9.770***	9.296***	2.770***	12.464***
	(1.386)	(0.333)	(0.072)	(0.166)	(1.226)	(0.710)	(0.252)	(0.060)	(0.160)	(0.955)
β_2	-0.164	-0.169***	-0.011**	0.820***	0.417***	-0.466***	-0.292***	-0.066***	0.369***	0.175**
	(0.154)	(0.035)	(0.005)	(0.017)	(0.086)	(0.112)	(0.038)	(0.005)	(0.011)	(0.081)
β_3	-0.087*	-0.046***	0.028***	0.454***	0.086*	-0.056*	-0.002	0.028***	0.364***	-0.03
	(0.009)	(0.011)	(0.003)	(0.008)	(0.047)	(0.029)	(0.009)	(0.002)	(0.008)	(0.041)
β_4	-0.061	-0.006	-0.228***	-0.248***	-0.413***	-0.142	0.038	-0.217***	-0.108***	-0.528***
	(0.090)	(0.038)	(0.006)	(0.019)	(0.094)	(0.108)	(0.041)	(0.003)	(0.012)	(0.094)
β_5	-3.107***	-0.082	1.805***	2.723***	6.311***	-3.240***	-0.600***	1.982***	1.599***	3.584***
	(1.044)	(0.240)	(0.045)	(0.170)	(0.969)	(0.530)	(0.177)	(0.038)	(0.062)	(0.696)
β_6	0.392**	0.179***	0.067***	-0.216***	-0.615***	0.754***	0.346***	0.030***	-0.105***	-0.414***
	(0.180)	(0.037)	(0.005)	(0.013)	(0.082)	(0.075)	(0.037)	(0.006)	(0.005)	(0.074)
β_7	0.163***	0.014**	-0.095***	-0.099***	-0.178***	0.032	-0.018**	-0.098***	-0.057***	-0.046*
	(0.041)	(0.006)	(0.002)	(0.007)	(0.038)	(0.041)	(0.008)	(0.001)	(0.005)	(0.026)
pseudo-R^2	0.866	0.928	0.933	0.814	0.931	0.900	0.941	0.932	0.821	0.927
Obs	80	160	240	320	80	80	160	240	320	80

Notes: The series are in logarithms. The α_i's terms are included in the estimation but are omitted in the table. Productivity is measured by either labor productivity (VA/L) or total factor productivity (TFP). Standard errors are specified to allow for heteroskedasticity, first-order autocorrelation and cross-sectional correlation of the residuals. The symbols *, **, and *** refer to levels of significance of 10%, 5%, and 1%, respectively.